



EDGEWOOD CHEMICAL BIOLOGICAL CENTER

U.S. ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND
Aberdeen Proving Ground, MD 21010-5424

ECBC-TR-1327

BIOLOGICAL ENVIRONMENTAL SAMPLING TECHNOLOGIES ASSESSMENT

Jody Gostomski
Mark Gostomski
Carrie Poore
Robert Dorsey

RESEARCH AND TECHNOLOGY DIRECTORATE

Aaron Chonko
David Grieco

JOINT BIOLOGICAL TACTICAL DETECTION
SYSTEM PROGRAM OFFICE

Erick Swartz

CHEMICAL BIOLOGICAL INCIDENT RESPONSE FORCE
Indian Head, MD 20640-5164

Eric Schaffer

LEIDOS, INC.
Gunpowder, MD 21010-0068

December 2015

Approved for public release; distribution unlimited.



Disclaimer

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorizing documents.

| REPORT DOCUMENTATION PAGE | | | | Form Approved OMB No. 0704-0188 | | | | | | | | | |
|---|------------------|-------------------------|-------------------------------|---|---|------------|------------------|-----------|------------------|------------|-----------------|----------|------------|
| Public reporting burden for this collection of information is estimated to average 1 h per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS. | | | | | | | | | | | | | |
| 1. REPORT DATE (DD-MM-YYYY) XX-12-2015 | | 2. REPORT TYPE Final | | 3. DATES COVERED (From - To) Apr 2015 – Jun 2015 | | | | | | | | | |
| 4. TITLE AND SUBTITLE Biological Environmental Sampling Technologies Assessment | | | | 5a. CONTRACT NUMBER | | | | | | | | | |
| | | | | 5b. GRANT NUMBER | | | | | | | | | |
| | | | | 5c. PROGRAM ELEMENT NUMBER | | | | | | | | | |
| 6. AUTHOR(S) Gostomski, Jody; Gostomski, Mark; Poore, Carrie; Dorsey, Robert (ECBC); Chonko, Aaron; Grieco, David (JBTDs); Swartz, Erick (CBIRF); and Schaffer, Eric (Leidos) | | | | 5d. PROJECT NUMBER | | | | | | | | | |
| | | | | 5e. TASK NUMBER | | | | | | | | | |
| | | | | 5f. WORK UNIT NUMBER | | | | | | | | | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Director, ECBC, ATTN: RDCB-DRB-S, APG, MD 21010-5424 Joint Biological Tactical Detection System (JBTDs) Program Office, 5183 Blackhawk Road, APG, MD 21010-5424 Chemical Biological Incident Response Force (CBIRF), 3399 Strauss Ave, Suite 219, Indian Head, MD 20640-5164 Leidos Inc., P.O. Box 68, Gunpowder, MD 21010-0068 | | | | 8. PERFORMING ORGANIZATION REPORT NUMBER ECBC-TR-1327 | | | | | | | | | |
| 9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Joint Biological Tactical Detection System Program Office, 5183 Blackhawk Road, APG, MD 21010-5424 | | | | 10. SPONSOR/MONITOR'S ACRONYM(S) JBTDs | | | | | | | | | |
| | | | | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) | | | | | | | | | |
| 12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited. | | | | | | | | | | | | | |
| 13. SUPPLEMENTARY NOTES | | | | | | | | | | | | | |
| 14. ABSTRACT: U.S. Army Edgewood Chemical Biological Center, Research and Technology Directorate, BioSensors Branch spearheaded a technology down-select to identify surface-sampling collection and identification technology candidates to be used with the current Department of Defense Joint Biological Tactical Detection System (JBTDs)-selected Chemring Detection Systems (Charlotte, NC) ATHINA platform. A panel of subject matter experts, consisting of members from across the biodefense community, was assembled to evaluate and down-select submissions in response to a request for information for sample surface collection and identification technologies. Each technology was analyzed using an adjustable scoring matrix that was specific to the needs of the JBTDs program. This scoring matrix was designed to assess the time from collection to identification, number of biological warfare agent targets, size, compatibility of JBTDs identifier, ease of use, maturity, and consumable storage requirements. The JBTDs program placed an emphasis on technologies with both surface collection and integration with an identification device to minimize human interface. | | | | | | | | | | | | | |
| 15. SUBJECT TERMS <table border="0" style="width: 100%;"> <tr> <td style="width: 25%;">Identifier</td> <td style="width: 25%;">Surface-sampling</td> <td style="width: 25%;">Multiplex</td> <td style="width: 25%;">Biothreat agents</td> </tr> <tr> <td>Collection</td> <td>Handheld reader</td> <td>Portable</td> <td>Integrated</td> </tr> </table> | | | | | | Identifier | Surface-sampling | Multiplex | Biothreat agents | Collection | Handheld reader | Portable | Integrated |
| Identifier | Surface-sampling | Multiplex | Biothreat agents | | | | | | | | | | |
| Collection | Handheld reader | Portable | Integrated | | | | | | | | | | |
| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON | | | | | | | | |
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | Renu B. Rastogi | | | | | | | | |
| U | U | U | UU | 58 | 19b. TELEPHONE NUMBER (include area code) (410) 436-7545 | | | | | | | | |

Blank

PREFACE

The work described in this report was started in April 2015 and completed in June 2015.

The use of either trade or manufacturers' names in this report does not constitute an official endorsement of any commercial products. This report may not be cited for purposes of advertisement.

This report has been approved for public release.

Blank

CONTENTS

| | | |
|------|---|----|
| 1. | INTRODUCTION | 1 |
| 2. | COMPANY SUBMISSIONS | 2 |
| 2.1 | Alexeter Technologies Rapid Assessment Initial Detection (RAID) 8 Kit | 2 |
| 2.2 | ANP Technologies Nano Intelligent Detection System (NIDS)..... | 5 |
| 2.3 | BBI Detection BWA Integrated Multiplex Assay and Sampling System (IMASS) Instrument..... | 9 |
| 2.4 | BioMatrix Sciences InnovaPrep and Biomeme One3 Systems | 12 |
| 2.5 | InnovaPrep Rapid Filter Elution Kit | 15 |
| 2.6 | Meso Scale Diagnostics (MSD) Cartridge Reader | 18 |
| 2.7 | Q-linea Aquila 1000 Instrument | 21 |
| 2.8 | QuickSilver Analytics All-In-One Sample Collection Swab..... | 24 |
| 2.9 | QuickSilver Analytics Biological Sampling Kit (BiSKit) | 27 |
| 2.10 | QuickSilver Analytics Bulk Bio Collection (B2C) Kit..... | 30 |
| 2.11 | SRC Aklus Shield Kit | 33 |
| 2.12 | U.S. Army Mano Sampling Kit | 37 |
| 3. | DISCUSSION | 40 |
| | ACRONYMS AND ABBREVIATIONS | 43 |
| | APPENDIX: REQUEST FOR INFORMATION | 45 |

FIGURES

| | | |
|-----|--|----|
| 1. | Alexeter RAID 8 kit..... | 2 |
| 2. | ANP Technologies NIDS instrument..... | 6 |
| 3. | BBI IMASS instrument..... | 9 |
| 4. | BioMatrix Sciences Innovaprep and Biomeme one3 systems..... | 12 |
| 5. | InnovaPrep Rapid Filter Elution kit..... | 15 |
| 6. | MSD cartridge reader..... | 18 |
| 7. | Q-linea Aquila 1000 instrument..... | 21 |
| 8. | QuickSilver Analytics all-in-one sample collection swab..... | 24 |
| 9. | QuickSilver Analytics BiSKit..... | 27 |
| 10. | QuickSilver Analytics B2C kit..... | 30 |
| 11. | SRC Aklus Shield kit..... | 34 |
| 12. | U.S. Army Mano sampling kit..... | 37 |

TABLES

| | | |
|-----|--|----|
| 1. | Alexeter Technologies RAID 8 Criteria | 3 |
| 2. | ANP Technologies NIDS Criteria | 7 |
| 3. | BBI Detection BWA IMASS Criteria..... | 10 |
| 4. | BioMatrix Sciences InnovaPrep and Biomeme One3 Criteria | 13 |
| 5. | InnovaPrep Rapid Filter Elution Kit Criteria..... | 16 |
| 6. | MSD Cartridge Reader Criteria | 19 |
| 7. | Q-linea Aquila 1000 Criteria | 22 |
| 8. | QuickSilver Analytics All-In-One Sample Collection Swab Criteria | 25 |
| 9. | QuickSilver Analytics BiSKit Criteria..... | 28 |
| 10. | QuickSilver Analytics B2C Criteria | 31 |
| 11. | SRC Aklus Shield Criteria..... | 35 |
| 12. | U.S. Army Mano Sampling Kit Criteria | 38 |
| 13. | RFI Summary Response Criteria | 41 |

BIOLOGICAL ENVIRONMENTAL SAMPLING TECHNOLOGIES ASSESSMENT

1. INTRODUCTION

In May 2015, the Department of Defense (DoD) Joint Biological Tactical Detection System (JBTDS) program office selected the Chemring Detection Systems (Charlotte, NC) ATHINA platform for its suite of technologies. The suite consists of a modular set of aerosol detector, collector, and identifier components. Before the award, the JBTDS program office engaged its combat developers and recognized a desire, particularly for those from the Special Operations Command (SOCOM) and the Marine Corps communities, to include sample surface collection requirements and near-real-time presumptive identification capabilities. To help determine how to meet this potential need, a request for information (RFI) was issued to solicit input from both industry and federal vendors. The RFI, titled W911SR-15-ESSRFI, was posted on 12 March 2015 and closed on 10 April 2015.

This RFI received responses from nine industrial vendors and one government vendor. The responses ranged from technologies for collection or identification only to integrated collection and identification technologies. To evaluate and categorize the submissions, a subject matter expert (SME) panel, consisting of eight members from across the biodefense community, convened on 12 May 2015 at U.S. Army Edgewood Chemical Biological Center. The SME panel represented a variety of disciplines including end-users, CBRNE trainers, and biological and chemical specialists. This report summarizes the SME panel assessment of the submitted technologies with regard to their applicability to JBTDS.

The analysis was based on the RFI responses and the SME knowledge and experience. The analysis of each technology was captured in a criteria table (Table 1) that categorizes and scores a comprehensive list of attributes including physical characteristics (e.g., size, weight, etc.) and performance characteristics (e.g., ease of use, JBTDS compatibility, etc.). Each technology was analyzed using an adjustable scoring matrix that was specific to the needs of the JBTDS program. This scoring matrix was designed to assess the time from collection to identification, number of biological warfare agent (BWA) targets, size, JBTDS identifier compatibility, ease of use, maturity, and consumable storage requirements. The JBTDS program placed an emphasis on technologies with both surface collection and integration with an identification device to minimize human interface. The customer need was also driven by the need for operation in mission-oriented protective posture (MOPP) IV and for compatibility with the JBTDS identifier.

Although the SME panel scored technologies based on their fit into the JBTDS program needs, the criteria table clearly shows how these scores and the weight applied to each specific attribute were obtained. This was important because the requirements of sample collection and rapid biological identification missions are usually unique. By breaking out the scoring weight, also known as the “attribute weight”, it is the hope of the panel that this analysis might serve as a foundation for other Federal agencies that seek to advance their capabilities in these areas.

2. COMPANY SUBMISSIONS

2.1 Alexeter Technologies Rapid Assessment Initial Detection (RAID) 8 Kit

Vendor: Alexeter Technologies,
LLC; Wheeling, IL
Phone: 877.591.5571
Website: www.alexeter.com

The Alexeter Technologies RAID 8 biothreat detection kit (Figure 1) is used to screen environmental samples for the simultaneous evaluation of eight biological threat agents. The RAID 8 is a multichannel, lateral-flow immunochromatographic device that is partnered with the Alexeter collection swab for sample collection.

The Alexeter RAID 8 kit is a straight-forward, surface-sampling device that simplifies the process from that used with the current DoD biological sampling kit. It reduces the number of inoculation points from eight to two. As noted by the SME panel, the small size of the RAID 8 kit makes it suitable for carrying in tactical situations and amenable for analyzing samples while wearing MOPP IV gear. A disadvantage of the system is that the collection and identification processes are not integrated into one unit. The SME panel was also concerned with the volume available for downstream analysis. Table 1 outlines the overall score of the RAID 8 kit.



Figure 1. Alexeter RAID 8 kit.

Table 1. Alexeter Technologies RAID 8 Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 15 | 10 | 100 | 100 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | no. of targets | <5 | 5+ | 10+ | 10 | 100 | 8 | 7 | 70 | 70 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | <2 | 10 | 100 | 200 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 45 g | 10 | 100 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 7 × 0.5 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | 9 × 6 × 0.25 in. | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | <1 | 1 | 10 | 80 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Separate | 7 | 70 | 310 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | No leakage | 10 | 100 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |

PBS: phosphate buffer solution; N/A: not applicable; PPE: personal protective equipment

Table 1. Alexeter Technologies RAID 8 Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 |
| | Federal/defense availability | 10 | National stock number (NSN) availability | Availability | NSN unavailable | NSN in Federal System | NSN in Defense Logistics Agency System | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | None | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | None | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | None | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL 920 | | | | | | | | | | | | | |

2.2

ANP Technologies Nano Intelligent Detection System (NIDS)

Vendor: ANP Technologies, Inc.;
Newark, DE
Phone: 302.283.1730
Website: www.anptinc.com

The ANP Technologies, Inc. NIDS rapid biothreat detection system (Figure 2) is used to detect BWAs in environmental samples. Three five-plex* NIDS assays that cover 11 BWA targets and a handheld reader are fielded by the U.S. Army SOCOM, Department of Homeland Security, Federal Emergency Management Agency, and National Guard units within 50 states in the United States. These targets include *Bacillus anthracis* spores, vaccinia (smallpox), botulinum A toxin, ricin toxin, staphylococcal enterotoxin B (SEB) toxin, *Yersinia pestis*, *Coxiella burnetii*, *Brucella* spp., Venezuelan equine encephalitis (VEE), and *Vibrio cholerae*. These assays demonstrate true multiplex capability, high sensitivity, low false-positive rates, and no hook effect. All of these results have been fully validated by a third party.

The base technology that ANP staff utilize in the NIDS multiplexed assays is termed “nanomanipulation” or the use of surface-modified dendritic polymer scaffolds to improve lateral-flow assay performance for the detection of target pathogens or protein biomarkers in liquid matrices. The nanomanipulation technology provides a dramatic increase in the sensitivity of the assays and virtually eliminates false-positive responses from nonspecific binding reactions. The system also includes an automated handheld reader capable of reading and analyzing the assays under all lighting conditions and then storing the results as an electronic record. The SME panel was concerned about decontaminating the reader after exposure to a BWA without losing functionality of the electronic device. Table 2 outlines the overall score of the NIDS assays.

* Plex, multiplex (a type of assay that simultaneously measures multiple analytes).



Figure 2. ANP Technologies NIDS instrument.

Table 2. ANP Technologies NIDS Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 15 | 10 | 100 | 100 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | no. of targets | <5 | 5+ | 10+ | 10 | 100 | 5 | 7 | 70 | 70 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 1 | 10 | 100 | 110 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 10.1 | 1 | 10 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 2 × 2 × 8 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | 5 × 4 × 2.5 in. | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 7 | 10 | 100 | 170 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Separate | 7 | 70 | 250 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | No leakage | 10 | 100 | |

Table 2. ANP Technologies NIDS Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score | |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|--|--------------------|---------------|-----------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | | |
| Ease of Use | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | 250 | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 | |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | | |
| Consumables Storage Requirement | Ancillary equipment | Info Only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | | SAR reader collection materials and buffer | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 | |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | | 3 AA | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | | 6 h | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | | Not provided | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | | Not provided | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL | | | | | | | | | | | | | 860 | |

2.3

BBI Detection BWA Integrated Multiplex Assay and Sampling System (IMASS) Instrument

Vendor: BBI Detection; Madison, WI

Phone: 608.310.4105

Website: www.bbidetection.com

The BBI Detection BWA IMASS (Figure 3) is a handheld, portable instrument that consists of a set of eight lateral-flow immunoassays (LFIs) positioned radially within a cylindrical holder. The device runs eight tests simultaneously from one sample and provides results for all eight biothreat agents (*B. anthracis*, ricin toxin, *Francisella tularensis*, *Y. pestis* [Plague], *Burkholderia mallei*, *Brucella* spp., botulinum toxins A and B, and SEB) in 15 min. The multiple-LFI IMASS housing was designed to cause little-to-no impact on sensitivity over a similar single-LFI test that involves a more simplistic housing. All tests are standard sandwich LFIs. One benefit of the IMASS instrument is that the collection and identification are integrated into one unit. The robust and rugged ergonomic design makes the BWA IMASS instrument easy to use, even when wearing MOPP IV gear. The device is easily decontaminated by immersion after sampling because the sample is fully contained. BBI Detection personnel claim that a technology update of the original BWA IMASS instrument, the NG IMASS instrument, is in development (Technology Readiness Level-6) and will contain 10–12 LFI strips. The current version of the IMASS used British-developed assays, but BBI Detection personnel claim that the NG IMASS instrument will be compatible with Critical Reagent Program LFI strips.

The SME panel determined that the BWA IMASS instrument had a strong potential for utility in a surface collection and identification mission. The integrated sampler and identification technology significantly reduces the manipulation efforts needed by a user wearing MOPP IV. The SME panel expressed a concern that only minimal amounts of fluid sample could be extracted from the IMASS instrument for follow-on analysis with the JBTDS identifier. In addition, the buffer for the current BWA IMASS instrument was provided in a dropper bottle that was separate from the integrated sampler and identifier. Table 3 outlines the overall score of the IMASS instrument.



Figure 3. BBI IMASS instrument.

Table 3. BBI Detection BWA IMASS Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|-------------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 15 | 10 | 100 | 100 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | no. of targets | <5 | 5+ | 10+ | 10 | 100 | 8 | 7 | 70 | 70 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 0.2 | 10 | 100 | 200 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 0.2 | 10 | 100 | |
| | Collector Size | Info only | Approximate size of collector | ft² | Informational only | | | | | 5 × 2 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft² | Informational only | | | | | | N/A | N/A | Info only |
| JBTDS Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 1.4 | 7 | 70 | 140 |
| | Buffer compatibility | 10 | The current version of the JBTDS uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDS combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Integrated | 10 | 100 | 400 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Easy | 10 | 100 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No Leakage | 10 | 100 | None | 10 | 100 | |

Table 3. BBI Detection BWA IMASS Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Ease of Use | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Easy | 10 | 100 | 400 |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal System | NSN in Defense Logistics Agency System | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | PBS bottle | N/A | N/A | Info Only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs. Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | No | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | \$130.00 | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | \$127.00 | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | 3 in.² | N/A | N/A | Info only |
| GRAND TOTAL 1070 | | | | | | | | | | | | | |

Vendor: BioMatrix Sciences, Inc.;
Rancho Santa Fe, CA
Phone: 508.451.4444
Website: www.biomatrixsciences.com

The BioMatrix Sciences InnovaPrep (Figure 4) handheld instrument is a manually operated, universal extraction kit that is specifically designed for the extraction, cleanup, and concentration of biological agents from surface liquids, powders, and debris. For identification, the InnovaPrep is paired with the Biomeme one3 instrument, which is a simple-to-use handheld, quantitative polymerase chain reaction (qPCR) device that delivers results in 45 min or less. A disadvantage of the system is that the collection and identification processes are not integrated into one unit. Concern was also expressed regarding operation of the smartphone-based Biomeme one3 while individuals are wearing MOPP IV gear. Table 4 outlines the overall score of the InnovaPrep system.

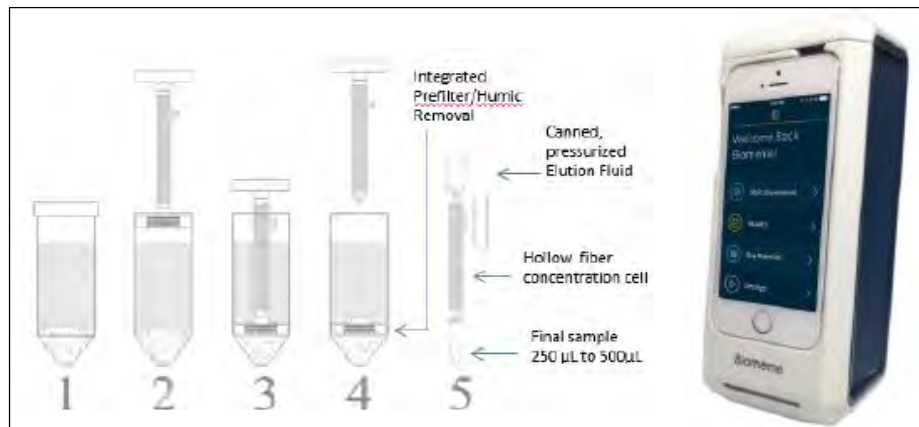


Figure 4. BioMatrix Sciences InnovaPrep and Biomeme one3 systems.

Table 4. BioMatrix Sciences InnovaPrep and Biomeme One3 Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20-45 | ≤20 | 10 | 100 | >45 | 1 | 10 | 10 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | no. of targets | <5 | 5+ | 10+ | 10 | 100 | 6 | 7 | 70 | 70 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2-5 | <2 | 10 | 100 | <1 | 10 | 100 | 200 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2-5 | <2 | 10 | 100 | <1 | 10 | 100 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 2 × 2 × 8 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | 5.25 × 2.5 × 1.5 in. | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1-6 | >6 | 10 | 100 | 6 mL | 7 | 70 | 140 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Separate | 7 | 70 | 160 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | Likely leaks | 1 | 10 | |

Table 4. BioMatrix Sciences InnovaPrep/Biomeme One3 Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|--|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Ease of Use | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | PCR reagents | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Collector is single use | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/No | Informational only | | | | | Battery | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | 8 runs | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | Instrument is \$5–8.5k; Assays are \$19/test | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | Unknown | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL 740 | | | | | | | | | | | | | |

2.5

InnovaPrep Rapid Filter Elution Kit

Vendor: InnovaPrep, LLC;
Drexel, MO
Phone: 816.619.3375
Website: www.innovaprep.com

The InnovaPrep Rapid Filter Elution kit (Figure 5) is a user-friendly disposable device that can be used for a variety of environmental sample types, including solids, powders, liquids, soils, insects, liquids, and surfaces. The device provides sample cleanup and concentration and is compatible with many identifier platforms, including PCR, immunoassay, LFI, other immunoassays, gene sequencing, culturing, flow cytometry, and many other classical microbiology and rapid methods. One disadvantage of the system is that it is used for collection only. Table 5 outlines the overall score of the Rapid Filter Elution kit.



Figure 5. InnovaPrep Rapid Filter Elution kit.

Table 5. InnovaPrep Rapid Filter Elution Kit Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 0 | 0 | 0 | 0 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | No. of targets | <5 | 5+ | 10+ | 10 | 100 | 0 | 0 | 0 | 0 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 8 oz | 10 | 100 | 100 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 0 | 0 | 0 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 11 × 6 × 4 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 6 | 7 | 70 | 170 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | Tris | 10 | 100 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Only collection | 1 | 10 | 160 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No Leakage | 10 | 100 | Leaks | 1 | 10 | |
| | MOPP IV operable | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |

Table 5. InnovaPrep Rapid Filter Elution Kit Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | Buffer | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | No | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | \$19.90 | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | N/A | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL | | | | | | | | | | | | | 590 |

2.6

Meso Scale Diagnostics (MSD) Cartridge Reader

Vendor: Meso Scale Diagnostics, LLC; Rockville, MD
Phone: 240.314.2600
Website: www.mesoscale.com

The MSD cartridge reader platform (Figure 6) is a compact, portable instrument that processes single-use cartridges to perform multiplexed immunoassay identification on environmental and clinical samples. The new instrument platform utilizes the MSD Multi-Array technology, which combines sensitive electrochemiluminescence detection with array-based measurements that are made on carbon ink surfaces. The instrument can process a wide variety of sample types and is targeted at applications such as biothreat detection, biodosimetry, infectious disease diagnostics, and clinical biomarker measurements. Table 6 outlines the overall score of the MSD cartridge reader.



Figure 6. MSD cartridge reader.

Table 6. MSD Cartridge Reader Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 20–25 | 7 | 70 | 70 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | no. of targets | <5 | 5+ | 10+ | 10 | 100 | 20 | 10 | 100 | 100 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | <2 | 10 | 100 | 110 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 17.5 | 1 | 10 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | 9 × 8 × 14 in. | N/A | N/A | Info only |
| JBTDS Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 0 | 1 | 10 | 80 |
| | Buffer compatibility | 10 | The current version of the JBTDS uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDS combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Separate | 7 | 70 | 250 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | | No leakage | 10 | 100 | No leakage | 10 | 100 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |

Table 6. MSD Cartridge Reader Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | <6 months | 7 | 70 | 80 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | Pipette or swab | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | 2–8 | 7 | 35 | 35 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | 4 runs | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | N/A | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | N/A | N/A | N/A | Info only |
| GRAND TOTAL | | | | | | | | | | | | | 725 |

2.7

Q-linea Aquila 1000 Instrument

Vendor: Q-linea AB; Uppsala, Sweden
Phone: +46.0.18.444.36.10
Website: www.qlinea.com

The Q-linea Aquila 1000 instrument (Figure 7) can provide fully automated, 24/7, random-access monitoring of biothreat agents in the air. The Aquila platform is currently configured for spore detection, but it can be adapted for identification of bacteria, viruses, and toxins in the same sample with state-of-the-art sensitivity. No sampling-collection instrument was proposed by the vendor to be used in conjunction with this identification technology. Table 7 outlines the overall score of the Aquila 1000 instrument.



Figure 7. Q-linea Aquila 1000 instrument.

Table 7. Q-linea Aquila 1000 Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | >45 | 1 | 10 | 10 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | No. of targets | <5 | 5+ | 10+ | 10 | 100 | >10 | 10 | 100 | 100 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 0 | 0 | 0 | 10 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | >5 | 1 | 10 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 0 | 0 | 0 | 0 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | 0 | 0 | 0 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Only identification | 1 | 10 | 130 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | No leaks | 10 | 100 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |

Table 7. Q-linea Aquila 1000 Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | 6 months to 1 year | 7 | 70 | 80 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | PCR reagents | N/A | N/A | Info Only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | 2–8 | 7 | 35 | 35 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Instrument is multiple use | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | 110 or 240V | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | N/A | N/A | N/A | Info only |
| GRAND TOTAL | | | | | | | | | | | | | 365 |

2.8

QuickSilver Analytics All-In-One Sample Collection Swab

Vendor: QuickSilver Analytics
Inc.; Abingdon, MD
Phone: 410.676.4300
Website: www.chembiokits.com

Personnel using the QuickSilver Analytics all-in-one sample collection swab device (Figure 8) are able to perform sample analysis while wearing MOPP IV gear. A disadvantage of the system is that it is used for collection only. The SME panel also had a concern with the volume that was available for downstream analysis. Table 8 outlines the overall score of the all-in-one sample collection swab.



Figure 8. QuickSilver Analytics all-in-one sample collection swab.

Table 8. QuickSilver Analytics All-In-One Sample Collection Swab Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 0 | 0 | 0 | 0 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | no. of targets | <5 | 5+ | 10+ | 10 | 100 | 0 | 0 | 0 | 0 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 2 oz | 10 | 100 | 100 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 0 | 0 | 0 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 7 × 0.5 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 0.6 | 1 | 10 | 80 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Only collection | 1 | 10 | 250 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | No leakage | 10 | 100 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |

Table 8. QuickSilver Analytics All-In-One Sample Collection Swab Criteria Table (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | > 1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN Unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | None | N/A | N/A | Info Only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration, high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs Multi-Use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | \$31.17 | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | N/A | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL | | | | | | | | | | | | | 590 |

2.9

QuickSilver Analytics Biological Sampling Kit (BiSKit)

The QuickSilver Analytics BiSKit (Figure 9) is designed to sample surfaces for bacteria, viruses, and toxins and to deliver a sample in a liquid with sufficient volume for extensive testing and archiving. This kit is designed to minimize cross-contamination when multiple samples are taken, to be transportable following sampling, and to safely capture the liquid sample in a collection vial that can dispense fluid drop-wise for analysis. A disadvantage of the system is that it is used for collection only. Table 9 outlines the overall score of the BiSKit.



Figure 9. QuickSilver Analytics BiSKit.

Table 9. QuickSilver Analytics BiSKit Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 0 | 0 | 0 | 0 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | No. of targets | <5 | 5+ | 10+ | 10 | 100 | 0 | 0 | 0 | 0 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 10 oz. | 10 | 100 | 100 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 0 | 0 | 0 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 6.5 × 7 × 2.5 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | >6 | 10 | 100 | 170 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Collection only | 1 | 10 | 100 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | Leaks | 1 | 10 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |

Table 9. QuickSilver Analytics BiSKit Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 170 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Federal stock number | 7 | 70 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | Buffer | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/No | Informational only | | | | | N/A | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | \$55.21 | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | 10 ft² | N/A | N/A | Info only |
| GRAND TOTAL 590 | | | | | | | | | | | | | |

2.10 QuickSilver Analytics Bulk Bio Collection (B2C) Kit

The QuickSilver Analytics B2C kit (Figure 10) meets Method A of *Standard Practices for Bulk Sample Collection and Swab Sample Collection of Visible Powders Suspecting of Being Biological Agents from Nonporous Surfaces*, ASTM International (West Conshohocken, PA) standard E2458-10. A disadvantage of the system is that it is used for collection only. Table 10 outlines the overall score of the B2C kit.



Figure 10. QuickSilver Analytics B2C kit.

Table 10. QuickSilver Analytics B2C Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 0 | 0 | 0 | 0 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | No. of targets | <5 | 5+ | 10+ | 10 | 100 | 0 | 0 | 0 | 0 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 12 oz | 10 | 100 | 100 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 0 | 0 | 0 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 13 × 14 × 4 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | >6 | 10 | 100 | 170 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | PBS | 7 | 70 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Collection only | 1 | 10 | 250 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | No leakage | 10 | 100 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Moderate | 7 | 70 | |

Table 10. QuickSilver Analytics B2C Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|------------------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | Immediate | 10 | 100 | 110 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | Bags, chain of custody form, tubes | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | No | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | \$34.70 | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | N/A | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes, bulk material | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL | | | | | | | | | | | | | 680 |

2.11

SRC Aklus Shield Kit

Vendor: SRC, Inc.; Syracuse, NY
Phone: 315.452.8000
Website: www.srcinc.com

The SRC Aklus Shield collection consumable kit (Figure 11) consists of an InnovaPrep filter, elution container, elution lid, and elution fluid. Electret filters, produced from dielectric polymer fibers, develop an electrical charge that substantially increases the collection efficiency of the filter. The 52 mm electret filter can also be used as a manual surface wipe to extract particles from all types of surfaces and absorb unknown liquids. The Aklus Shield system can also be used to sample debris, soil, or vegetation.

For this study, SRC personnel submitted a separate identifier, which is a re-engineered Biomeme PCR identifier, and integrated five of the three-well thermal cyclers together into an environmentally hardened case. The SRC staff also extended the operational temperature of the Biomeme system so that it will work from freezing (32 °F) to hot (104 °F) environments. The identifier was also hardened to survive the other challenges of a military environment, such as shock, vibration, and electromagnetic interference.

Although this system uses five independently controllable thermal cyclers with their associated smart phones, the operator has to push only a single button to start the analysis. The center iPhone camera is used to read a barcode on the assay pack to automatically set each thermal cycler core temperature–time profile and to identify the assays are in each well. The extremely simple operation of the SRC Aklus Shield device, its small size and easy-to-carry configuration, and assays that require no sample cleanup, all combine to support multiple identification runs at any location in the operational area by a single operator. With this 15-well design, the system can simultaneously run assays for 10 targets with controls. In the case of the JBTDS program, these 10 targets included six qPCR assays, one reverse transcriptase-qPCR (RT-qPCR) assay, and three toxin assays. The identifier in the SRC system can be configured to meet user needs. Table 11 outlines the overall score of the Aklus Shield kit.

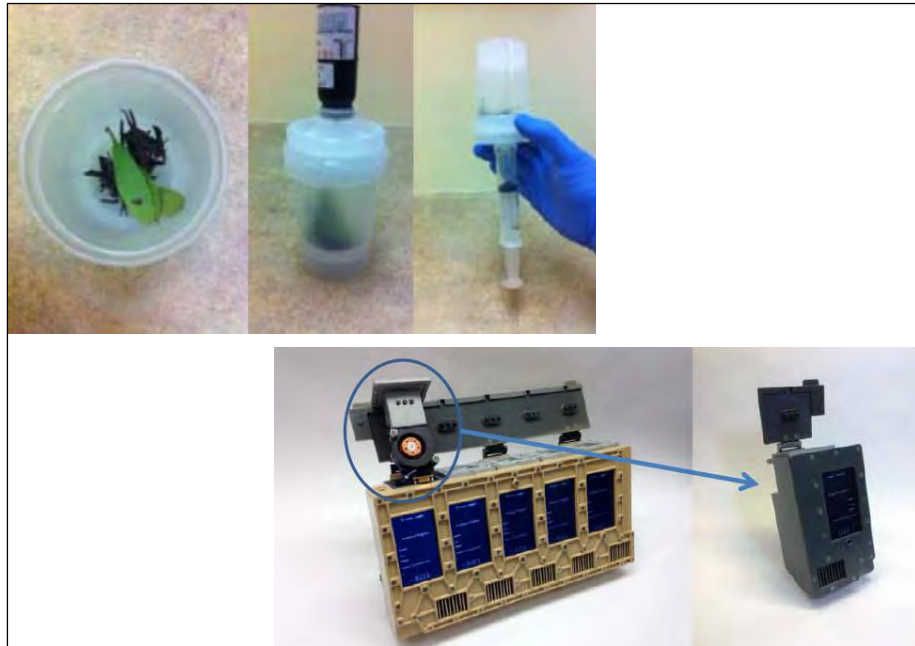


Figure 11. SRC Aklus Shield kit.

Table 11. SRC Aklus Shield Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | >45 | 1 | 10 | 10 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | No. of targets | <5 | 5+ | 10+ | 10 | 100 | 10 | 10 | 100 | 100 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 8 oz | 10 | 100 | 200 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | <2 | 10 | 100 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 11 × 6 × 4 in. | N/A | N/A | Info Only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | 4 × 4 × 7.5 in. | N/A | N/A | Info Only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 6 | 7 | 70 | 170 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | Tris or PBS | 10 | 100 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Separate | 7 | 70 | 100 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | Leaks | 1 | 10 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Difficult | 1 | 10 | |

Table 11. SRC Aklus Shield Criteria (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | 6 months | 7 | 70 | 80 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | PCR assays | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration, high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/ multi | Informational only | | | | | Collector is single use | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | Battery | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | 4 runs | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | \$19.90 | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of Surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling Area Size | Info only | The size of the area from which the samples can be collected. | ft² | Informational only | | | | | Not provided | N/A | N/A | Info only |
| GRAND TOTAL 710 | | | | | | | | | | | | | |

2.12

U.S. Army Mano Sampling Kit

Vendor: U.S. Army Edgewood
Chemical Biological Center;
Aberdeen Proving Ground, MD
Phone: 410.436.4998
Website: www.ecbc.army.mil

The U.S. Army Mano sampling kit device (Figure 12) facilitates biological sampling by personnel using a single hand. The fundamental design of the kit greatly simplifies surface-sampling tasks performed while wearing MOPP gear in a hazardous environment. A major advantage of this one-handed sampling device is that after completing the surface-sampling, the device is easily turned inside out to become its own transport container, thus accelerating sampling tasks and reducing waste. The kit was designed to sample a variety of surface types and uses buffers that are known to be compatible with current DoD detection technologies. This sampling kit is versatile because it can be used to collect samples from traditional surfaces (e.g., wood, tile, plastic, steel, concrete, glass, and plastic), and it is capable of absorbing liquid samples off these surfaces as well. Finally, the Mano sampling kit is designed to give the operator or end-user the ability to perform “grab” and bulk sampling. A disadvantage of the system is that it is used for collection only. Table 12 outlines the overall score of the Mano sampling kit.

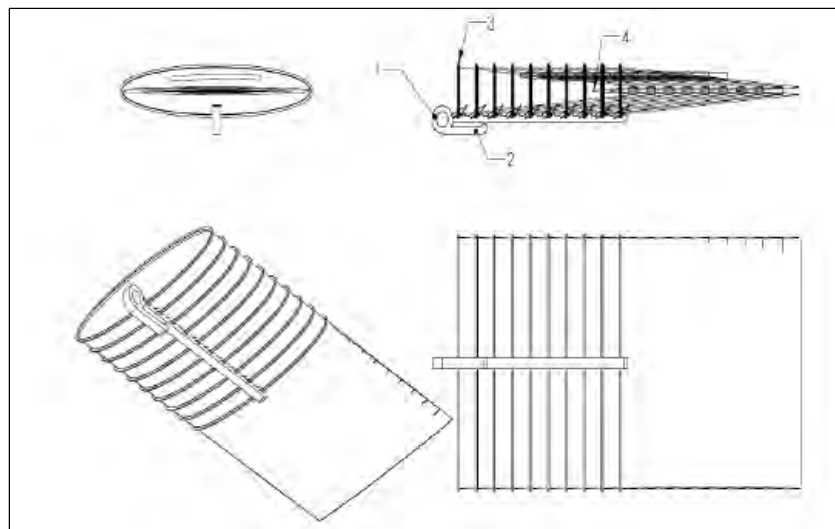


Figure 12. U.S. Army Mano sampling kit.

Table 12. U.S. Army Mano Sampling Kit Criteria

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | VendorSupplied Information | | | Overall Score |
|--------------------------------|---|----------------------------|---|-------------------|-----------------------------------|--|------------|------------------|--------------------|----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Time from Collection to ID | Time from collection to identification | 10 | User-described need is for near real-time identification | min | >45 | 20–45 | ≤20 | 10 | 100 | 0 | 0 | 0 | 0 |
| Number of Targets per Sample | Multiplex capability | 10 | Number of targets per identification run | No. of targets | <5 | 5+ | 10+ | 10 | 100 | 0 | 0 | 0 | 0 |
| Size | Collector weight | 10 | Approximate weight of collector | lb | >5 | 2–5 | <2 | 10 | 100 | 0.151 lb | 10 | 100 | 100 |
| | Identifier weight | 10 | Weight of identifier | lb | >5 | 2–5 | <2 | 10 | 100 | 0 | 0 | 0 | |
| | Collector size | Info only | Approximate size of collector | ft ² | Informational only | | | | | 7.75 × 5.5 × 1.5 in. | N/A | N/A | Info only |
| | Identifier size | Info only | Approximate size of identifier | ft ² | Informational only | | | | | N/A | N/A | N/A | Info only |
| JBTDs Identifier Compatibility | Sample volume | 10 | Volume provided from collector/identifier for follow-on identification | mL | 0 | 1–6 | >6 | 10 | 100 | 0 | 0 | 0 | 0 |
| | Buffer compatibility | 10 | The current version of the JBTDs uses a Tris-based identification buffer | Major component | Other | PBS | Tris | 10 | 100 | 0 | 0 | 0 | |
| Ease of Use | Integrated sample collection and identification | 10 | JBTDs combat developers have described user desire for rapid sample collection and identification in one system | N/A | Only collection or identification | Collection and identification separate | Integrated | 10 | 100 | Only collection | 1 | 10 | 310 |
| | Tactical fit | 10 | Shape and ruggedness | N/A | Difficult | Moderate | Easy | 10 | 100 | Easy | 10 | 100 | |
| | Sample security in transport | 10 | Collected sample has little potential for cross-contamination or risk to operator | N/A | Leaks | N/A | No leakage | 10 | 100 | No leakage | 10 | 100 | |
| | MOPP IV operability | 10 | Sample collection and identification tasks can be performed in MOPP IV PPE | N/A | Difficult | Moderate | Easy | 10 | 100 | Easy | 10 | 100 | |

Table 12. U.S. Army Mano Sampling Kit Criteria Table (Continued)

| Category | Attribute | Attribute Weight (1 to 10) | Description | Method of Measure | Grading Scale | | | Ideal Instrument | | Vendor-Supplied Information | | | Overall Score |
|---------------------------------|------------------------------|----------------------------|--|--------------------------|--------------------|------------------------|--|------------------|--------------------|-----------------------------|-------|--------------------|---------------|
| | | | | | Low (1) | Medium (7) | High (10) | Grade | Score (Wt × Grade) | Claim | Grade | Score (Wt × Grade) | |
| Maturity | Availability | 10 | Timeline until commercially available | Months | >1 year | <6 months up to 1 year | Immediately | 10 | 100 | >1 year | 1 | 10 | 20 |
| | Federal/defense availability | 10 | NSN availability | Availability | NSN unavailable | NSN in Federal system | NSN in Defense Logistics Agency system | 10 | 100 | Unavailable | 1 | 10 | |
| Consumables Storage Requirement | Ancillary equipment | Info only | List ancillary equipment requirement for operation of this instrument | List ancillary equipment | Informational only | | | | | None | N/A | N/A | Info only |
| | Consumables requirements | 5 | Special conditions required for consumables (e.g., refrigeration and high humidity) | Conditions | <2 °C | 2–8 °C | Room temperature | 10 | 50 | Room temperature | 10 | 50 | 50 |
| Single vs Multi-Use | Single vs multi-use | Info only | The instrument is reusable | Single/multi | Informational only | | | | | Single | N/A | N/A | Info only |
| Power | Power requirements | Info only | Battery required | Yes/no | Informational only | | | | | None | N/A | N/A | Info only |
| | Power requirements | Info only | Battery charge life | h | Informational only | | | | | N/A | N/A | N/A | Info only |
| Costs | Quoted cost | Info only | Collector cost | \$ | Informational only | | | | | Not provided | N/A | N/A | Info only |
| | Purchase cost | Info only | Identifier cost | \$ | Informational only | | | | | N/A | N/A | N/A | Info only |
| Sample and Surface Versatility | Types of surfaces | Info only | Can the device support all types of surface sampling to include but not limited to tile, concrete, wood, glass, stone, plastic, etc. | Yes/no | Informational only | | | | | Yes | N/A | N/A | Info only |
| | Sampling area size | Info only | The size of the area from which the samples can be collected | ft² | Informational only | | | | | Variable | N/A | N/A | Info only |
| GRAND TOTAL 480 | | | | | | | | | | | | | |

3. DISCUSSION

The members of the JBTDS program recognized a need for combat developers to improve sample surface collection and presumptive identification technologies that are available to the warfighter. This RFI was conducted to survey the commercial marketplace for tactical, lightweight, biological environmental sampling technologies that could satisfy this need (Table 13). Analysis of the RFI submissions was weighted to emphasize the time from sample collection to identification, number of targets per sample, multiplex capability, size, JBTDS identifier compatibility, ease of use, maturity, and consumable storage requirements. As a result, submissions with both collection and low-cost, single-use identifiers were ranked the highest. Several submissions included collection capability and identification with a multi-use instrument; however, these instruments did not meet the intended mission requirements, such as ease of use, small size, and low cost. Based on its analysis, the SME panel concluded that the BBI BWA IMASS and the Alexeter RAID 8 systems should be further evaluated with a more-comprehensive, third-party laboratory analysis that compares these devices to the current DoD biological sampling kit. However, if the JBTDS program office chooses to explore traditional collection-only technologies for surface sampling, the SME panel recommended further evaluation of the QuickSilver B2C and the Innovaprep Rapid Filter Elution kits. The InnovaPrep collection system is recommended over the QuickSilver All-In-One or QuickSilver BiSKit, despite their similar scores, because the InnovaPrep system is already part of the selected JBTDS system. Therefore, if the InnovaPrep system was selected, it would reduce the logistical footprint of the system through commonality. As with the integrated collection and identification technologies, a third-party laboratory analysis would be advised to verify performance of these technologies.

Table 13. RFI Summary Response Criteria

| Category | Collection with Single-Use Identifier | | Collection with Multi-Use Identifier | | | | Collection Only | | | | | Identifier Only |
|--|---------------------------------------|-----------------|--------------------------------------|------------------------------------|----------------------|------------------|-----------------|-------------------------------------|--------------------|------------------------|-----------------------------|---------------------|
| | BBI BWA IMASS | Alexeter RAID 8 | ANP NIDS | BioMatrix Innovaprep/ Biomeme One3 | MSD Cartridge Reader | SRC Aklus Shield | QuickSilver B2C | InnovaPrep Rapid Filter Elution Kit | QuickSilver BiSKit | QuickSilver All-In-One | U.S. Army Mano Sampling Kit | Q-linea Aquila 1000 |
| Time from Collection to Identification | 100 | 100 | 100 | 10 | 70 | 10 | 0 | 0 | 0 | 0 | 0 | 10 |
| Number of Targets Per Sample | 70 | 70 | 70 | 70 | 100 | 100 | 0 | 0 | 0 | 0 | 0 | 100 |
| Size | 200 | 200 | 110 | 200 | 110 | 200 | 100 | 100 | 100 | 100 | 100 | 10 |
| JBTDS Identifier Compatibility | 140 | 80 | 170 | 140 | 80 | 170 | 170 | 170 | 170 | 80 | 0 | 0 |
| Ease of Use | 400 | 310 | 250 | 160 | 250 | 100 | 250 | 160 | 100 | 250 | 310 | 130 |
| Maturity | 110 | 110 | 110 | 110 | 80 | 80 | 110 | 110 | 170 | 110 | 20 | 80 |
| Consumables | 50 | 50 | 50 | 50 | 35 | 50 | 50 | 50 | 50 | 50 | 50 | 35 |
| Total Score | 1070 | 920 | 860 | 740 | 725 | 710 | 680 | 590 | 590 | 590 | 480 | 365 |

Blank

ACRONYMS AND ABBREVIATIONS

| | |
|---------|--|
| B2C | bulk bio collection kit |
| BiSKit | Quicksilver Analytics biological sampling kit |
| BWA | biological warfare agent |
| DoD | Department of Defense |
| IMASS | Integrated Multiplex Assay and Sampling system |
| JBTDs | Joint Biological Tactical Detection System |
| LFI | lateral-flow immunoassay |
| MOPP | mission-oriented protective posture |
| MSD | Meso Scale Diagnostics |
| NIDS | Nano Intelligent Detection System |
| NSN | national stock number |
| PBS | phosphate buffer solution |
| PCR | polymerase chain reaction |
| plex | multiplex (assay) |
| PPE | personal protective equipment |
| qPCR | quantitative polymerase chain reaction |
| RAID | Rapid Assessment Initial Detection kit |
| RFI | request for information |
| RT-qPCR | reverse transcriptase-quantitative polymerase chain reaction |
| SEB | staphylococcal enterotoxin B |
| SME | subject matter expert |
| SOCOM | Special Operations Command |
| VEE | Venezuelan equine encephalitis |

Blank

APPENDIX: Request for Information



66--This market survey seeks to gather current, off-the-shelf, and future biological technologies for tactical and sensitive site exploitation for biological warfare agents (BWA) by the U.S. Armed Forces.

Solicitation Number: W911SR-15-ESSRFI

Agency: Department of the Army

Office: Army Contracting

Command Location: ACC-APG -
Edgewood

Notice Type: Sources Sought

Posted Date:

March 12, 2015

Response Date:

April 10, 2015

Archiving Policy:

Automatic, on specified date

Archive Date:

May 11, 2015

Original Set Aside:

N/A

Set Aside:

N/A

Classification Code:

66 -- Instruments & laboratory equipment

NAICS Code:

541 -- Professional, Scientific, and Technical Services/541711 -- Research and Development in Biotechnology

Synopsis:

Added: Mar 12, 2015 10:28 am

This is a sources sought announcement. There is no solicitation available at this time. Request for copies of solicitation will not receive a response.

OBJECTIVE

This market survey seeks to gather current, off-the-shelf, and future biological technologies for tactical and sensitive site exploitation for biological warfare agents (BWA) by the U.S. Armed Forces.

The purpose of this RFI is to conduct a market survey of tactical lightweight biological environmental sampling technologies from private industry. The Joint Product Manager for Biological Detection Systems' (JPdM-BDS) intent is to explore environmental surface sampling technologies with an identification capability that minimizes human interface.

DESCRIPTION (JBTDTS)

The Joint Biological Tactical Detection System (JBTDTS) will be employed as a modular set of capabilities (detector, collector, and identifier) that function independently or as a set of components that provide biological aerosol detection, collection, identification and reporting. JBTDTS will also provide a separate environmental collection capability able to support environmental surface sampling tasks for tactical and sensitive site exploitation.

REQUIREMENTS

Collected samples must be compatible with follow-on confirmatory identification using the following technologies and methods: Polymerase Chain Reaction (PCR), immunoassay, gene sequencing, culturing, etc... There must be enough collected sample remaining after identification to be used for further confirmative identification, which is approximately 6 ml of phosphate buffer saline (pbs). The time from point of collection to identification should be less than 20 minutes.

The device should be operable by one person in Mission Oriented Protective Posture (MOPP) IV with minimal training.

The device should support tactical carry with a weight of no more than 2 lbs.

The identifier sensitivity should be equal to immunoassay identification levels.

The environmental sampler must collect liquid and dry samples.

The identifier must have the capability to identify up to 10 Biological Warfare Agents (BWAs).

Sampling Capability: o Surface (Threshold): The device must support all types of surface sampling to include but not limited to: tile, concrete, wood, glass, stone, plastic, etc.. o

Vegetation and Soil (Objective): The device may support samples collected from vegetation and or soil.

PERFORMANCE DATA

1. Provide a brief description of the technology of your hardware broken out as a collector and identifier (if applicable).
2. State the size in length, width and height (cubic inches).
3. State the operational total weight with all components in pounds (lbs).
4. If battery power is required, how many hours can the hardware operate before battery change or charge is required. Describe the power source of the item.
5. State the various types of environmental sampling (e.g. soil, vegetative, multi surface, etc.) that is compatible with the collector / identifier. If there are multiple devices or adapters for collection of different types of environmental sampling, please list those as well.

6. State the various types of tests performed and corresponding results for identification of biological agents. Describe the state of the biological agent (liquid, solid) and the environment it was sampled from (soil, vegetation, solid surface, porous surface). Provide trial numbers, dates, and locations of testing.
7. State whether the device is single use (consumable) or multi use.
8. Identify what identifications technologies are potentially compatible with the collected sample from the collector (e.g. PCR, immunoassay, Lateral Flow Immunoassay (LFI).
9. Identify any consumables (e.g. buffers, filters, etc.) and any ancillary equipment (e.g. laptop, remote controller, etc.) that is needed to operate the detection and/or collection equipment.
10. State the length of time it takes for the collected sample to be identified.
11. For each device, state the size of the area that samples can be collected from.
12. State the amount of sample able to be collected with one device.
13. State the amount of sample that is needed for identification with the integrated identifier.
14. State the number of BWAs the identifier is able to successfully identify.

All responses and correspondence should be submitted electronically to Suzanne Drake, suzanne.m.drake2.civ@mail.mil NLT COB 10 April 2015.

Contracting Office Address:

ACC-APG - Edgewood, ATTN: AMSSB-ACC-E, 5183 Blackhawk Road, Aberdeen Proving Ground, MD 210105424

Place of Performance:

ACC-APG - Edgewood ATTN: AMSSB-ACC-E, 5183 Blackhawk Road Aberdeen Proving Ground MD 21010-5424 US

Point of Contact(s):

Suzanne M. Drake, 410-436-8417

[ACC-APG - Edgewood](#)

DISTRIBUTION LIST

The following organizations received one Adobe portable document format (pdf) electronic version of this report:

ECBC R&T Directorate, Biosciences
Division, BioSensors Branch
RDCB-DRB-S
ATTN: Gostomski, J.
Dorsey, R.

Defense Threat Reduction Agency
DTRA/RD-CBD T
Attn: Ward, T.
J9-CBS
ATTN: Moore, E.

Department of Homeland Security
DHS ORD CSAC
ATTN: Famini, G.

G-3 History Office
U.S. Army RDECOM
ATTN: Smart, J.

ECBC Technical Library
RDCB-DRB-BL
ATTN: Foppiano, S.
Stein, J.

Office of the Chief Counsel
AMSRD-CC
ATTN: Upchurch, V.

Defense Technical Information Center
ATTN: DTIC OA

ECBC Rock Island
RDCB-DES
ATTN: Lee, K.



UNCLASSIFIED//FOR OFFICIAL USE ONLY